labrum are occasionally indicated in patients with persistent symptoms that have not responded to expectant and symptomatic management.

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## Meniscal Repair

ONCE THOUGHT to be relatively unimportant, healthy functioning menisci are now known to be essential in preventing degenerative changes in the knee. The menisci decrease stress on the articular cartilage by increasing joint congruity, thereby enlarging the load-bearing surface of the joint. The meniscus also improves lubrication and decreases shear stress on the articular cartilage.

Meniscal tears with subsequent meniscectomy have been shown to lead to degenerative arthritis in the knee. Because of the importance of the meniscus in protecting the joint, attempts are now made to repair it and preserve its function whenever possible.

The meniscal tears most suitable for repair are peripheral tears in the more vascular portion of the meniscus. More central tears, degenerative tears, and radial tears, because of the relative avascularity, are not suitable for repair.

An arthroscopic technique is usually used for meniscal repair. The peripheral side of the tear and adjacent synovium are debrided to promote a vascular response and improve healing. Special instruments have been developed to allow suturing during arthroscopy. Small posterior extracapsular incisions and the placement of protective retractors are required to prevent unintentional injury to the posterior neurovascular structures.

The healing rate after meniscal repair, documented by second-look arthroscopy, is from 70% to 90%. Follow-up magnetic resonance imaging may show persistent signal changes in repaired menisci and has not been reliable in determining if a meniscus has healed after repair. Tears in the more vascular peripheral portion of the meniscus are more likely to heal. Meniscal repairs in unstable knees are less likely to heal due to the increased stress on the repair. Ligament reconstruction at the time of meniscal repair is generally recommended in unstable knees.

Postoperative treatment and rehabilitation required after meniscal repair are evolving and are somewhat controversial. Most surgeons feel that some period of restricted activity (six weeks on crutches, no sports for four to six months) is desirable to prevent excessive stress on the healing meniscus. But patients usually return to full activity within three to four weeks after a partial meniscectomy. In a young athlete, this may mean the difference between missing a few games and missing an entire season. Although meniscal repair is thought to be superior to partial meniscectomy in preventing degenerative arthritis, the procedure is too new for long-term follow-up data to be available. Current indications for meniscal repair include peripheral tears associated with ligamentous injury and isolated peripheral tears in a patient willing to comply with the postoperative restrictions. Contraindications include small peripheral tears less than 1 cm in length, as well as degenerative and radial tears.

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## Male Adolescent Idiopathic Scoliosis

ALTHOUGH SEVERAL STUDIES of the natural history of patients with idiopathic scoliosis have been reported, little is known about male adolescents with scoliosis. About 20% of cases of idiopathic scoliosis occur in boys. As boys are also undergoing school screening and therefore being referred for evaluation, it is helpful to physicians to know the risk of progression for a given curve in a male patient.

In the largest study of boys with idiopathic scoliosis, 32% had a curve increase by 10 degrees or more. Several factors related to curve progression were no different in male than in female patients. The curves most likely to progress were in younger boys with immature skeletons. Children who presented with larger curves were also more likely to worsen. Boys presenting with scoliosis measuring 30 degrees or more showed a tendency toward curve progression regardless of age.

The major difference between female and male adolescent idiopathic scoliosis is that curve progression stops in girls when they reach skeletal maturity. Girls with idiopathic scoliosis stabilize after reaching Risser stage 4 (a radiographic measure of skeletal maturity wherein the iliac apophysis is fully ossified but not fused). Boys with Risser stage 4 may continue to have curve progression. This is related to their prolonged phase of vertebral growth that persists after early adolescence.

The treatment of scoliosis in boys is similar to that in girls. A careful neurologic assessment should be done to look for other causes of the scoliosis, such as neuromuscular disease. Bracing is prescribed for progressive curves and curves presenting at 25 to 30 degrees or more. Compliance with brace wear is poor in adolescent boys. Weaning from the brace should be delayed in boys until all growth has ceased, which is usually later than the radiographic appearance of maturity.

Surgical spinal fusion is indicated for patients with curves of 50 degrees or greater. Conventional surgical techniques are equally effective. In a series of 210 male adolescents with idiopathic scoliosis, fusion became necessary in 21%.

The peak age at which boys present for the evaluation of idiopathic scoliosis is 13, about two years later than girls with scoliosis. This is appropriate because skeletal development in adolescent boys is delayed compared with girls of the same age and because scoliosis in boys can develop later and progress longer.

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## Physical Treatment of Soft Tissue Injuries

SOFT TISSUE INJURIES, such as strains of ligaments and muscle attachments, are often difficult to evaluate. Other than fleeting tenderness, there are few objective findings. If the injury is insufficient to cause subluxation or dislocation, physical examination, x-ray films, and even magnetic resonance imaging may not offer definitive information. Extensive physical therapy is often undertaken to reduce pain. Progress is often measured by subjective statements of pain relief. Excessive treatment, especially of injuries sustained in the workplace, has been documented. To what extent are the costs of therapy justified?

The word "injury" can be placed in quotes because it is often not clear whether the structural incompetence being treated is on the basis of progressive overload from cumulative trauma, or of a single traumatic event during an unguarded moment. Nonetheless, the rate of repair and the potential for spontaneous healing are often difficult to project when a patient is initially evaluated.

All information suggests that spontaneous healing of a non-joint-threatening soft tissue injury should be complete within five or six weeks. If not complete at that time, current evidence from sports medicine and basic studies of animals suggests that structured exercise programs are necessary to guide repair. The benefits of joint mobilization and passive treatment after six weeks or so are limited. The functional deficits created by the injury must be repaired by guided exercise programs. These principles apply to the whole array of sprains and strains that occur to all joints with cumulative or sudden overload. If the continuity of supporting ligaments and tendons has not been broken, healing is assisted by guided progressive exercises, not rest. Early passive care, such as hot packs, massage, and electrical stimulation, supports rest treatment.

If the care of soft tissue "injuries" is to be as justified as that for other medical diagnoses, the deficit must be documented through the measure of function, and measurable amounts of therapeutic exercise must be provided to guide the healing process. An assessment of the patient-client-worker's attitude must be part of the rehabilitation process. This is often accomplished by noting the patient's compliance with a measured exercise program.

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## Surgical Management of Spinal Metastases

PROGRESS IN ONCOLOGY and radiation therapy, coupled with an earlier diagnosis, has led to long-term survival of patients. Patients should therefore be afforded a high degree of comfort and quality of life during their treatment. The most common malignant tumors to metastasize to the capillary beds within the large cancellous bone mass of the vertebral column include those of breast, lung, lymphatic system, prostate, kidney, gastrointestinal tract, thyroid, and others, including those that are indeterminate. Depending on the location and behavior of the spinal metastases, pain, mechanical instability, or neurologic compromise may ensue.

Metastatic cancer to bone does not itself cause either pain or neurologic compromise. Pain occurs with the loss of osseous strength. Neurologic compromise arises from ischemia due to pressure on the spinal cord or nerve roots by tumor encroachment. Surgical therapy can help manage symptomatic spinal metastatic disease.

When one or more vertebral bodies are weakened by tumor replacement, deformation (fracture) may occur. Frequently radiotherapy or chemotherapy will control tumor growth and permit bone reconstitution. Persistent pain is an indicator of instability. Restoring stability through spinal reconstruction will frequently restore comfort and the quality of life.

Even when more than one vertebra has metastases, the location of the instability can be determined by clinical assessment and radiographs. Computed tomography or magnetic resonance imaging further defines involvement. When the pedicle is the primary site of involvement and the bony trabeculae are spared, posterior stabilization, supplementing irradiation or chemotherapy, restores stability. When the vertebral body trabecular structure has been largely supplanted by tumor, anterior stabilization with allograft or other spacer is indicated. Where feasible, radiotherapy should precede surgical therapy because graft-induced osteogenesis is inhibited by postoperative irradiation. Spine implants should be designed with sufficient stability to function for the rest of the patient's life